the slightest intimation that its claims to existence are any less valid than any other compound. It is stated that the water in the soil is weakly held, when as a matter of fact the film moisture is held by probably enormous stress and the reader is left in confusion as to just what the author means. It is not the simplest view (page 77) that the mineral particles are coated with a colloidal complex, but that the so-called colloidal properties of the soil are those resulting from the relatively vast surface presented by the "clay" portion of the soil; and it would be more satisfactory to utilize the fact that the solubility of calcium carbonate is increased by increasing the partial pressure due to carbon dioxide than assume the existence of a compound which can not exist at any gas pressures existing in the soil.

But when there is so very much that is admirable it makes one feel ungracious to continue criticisms of details. The book deliberately makes its major appeal to biologists, and the greater part of the text is devoted to the biological properties of the soil. But its most striking feature is the skilful handling of the contrasting views of soil chemists and physicists. While it is probable that others as well as the reviewer will not entirely agree with the author's presentation of recent controversies, every one will undoubtedly recognize the evident intent of fairness and careful effort to summarize correctly. It is very probable that no one could at this time make a better presentation than has Dr. Russell, although we may each hope that some future edition of his book may accord more closely with our several individual views. Fortunately for the development of this branch of applied science, modification of the personal views of most of the prominent workers is commendably frequent and frank. A satisfactory index and a well-selected bibliography are retained in the present edition.

Dr. Russell's monograph is not suited to class-room use of undergraduates in our agricultural colleges, though such undergraduates would undoubtedly profit by reading it. The book will prove a mine of suggestions to the advanced scholar and investigator and should prove an eloquent testimony for the view that the time has now come when our universities can afford to recognize that some agricultural subjects have developed to a point in dignity of effort and scholarship where they might profitably be included in the curriculum beside older and more familiar academic fields. The advances of the last few years in secondary rural education and in the standard of our American agricultural colleges is worthy cause of gratification. But it is almost a disgrace that our principal universities are utterly failing to train and provide leaders and teachers for what must always be our country's chief field of endeavor; and to recognize that the art of agriculture is passing—rapidly passing in the United States—from the avocation of the artisan to the profession of the highly trained specialist. Dr. Russell's book will not be the least of the instruments to bring about the change.

FRANK K. CAMERON

SHARK INTOXICATION[1]

THE flesh of the economically very important Greenland shark (*Somniosus microcephalus*), a shark usually between 6 and 14 feet in length occurring abundantly in the Arctic Ocean and ranging southward to Norway, the Faeroes, Iceland, Cape Cod, Oregon and Japan, has long been known to possess certain poisonous qualities.

It is not known to what extent the poisonous nature of the flesh of this fish is shared by that of other species of sharks, some of which, at least, appear to be quite harmless; but in view of the possibility that in the near future the flesh of some of our more abundant species of selachians may be placed on the market for the purpose of providing a cheap supply of good fresh food, it would seem opportune to call attention to what is known in regard to the undesirable qualities of the flesh of the Greenland shark in order that similar qualities in the flesh of other species, if present, may be immediately detected.

Mr. Ad. S. Jensen, of the zoological museum of the University of Copenhagen, has re-

[1] Published with the permission of the secretary of the Smithsonian Institution.

cently published[2] the following excellent summary of all that is definitely known concerning shark intoxication.

In North Greenland, where the dog plays such a large part as draught animal for the sledge, the shark fishery has the additional importance of providing food for the dogs. In the dried condition especially shark flesh is an excellent dog food; it gives the animals strength to sustain prolonged exertions without being fatigued. In the fresh condition, on the other hand, it is dangerous for the dogs; when they eat a quantity of it they become heavy and subject to giddiness (they are said to be "shark-intoxicated"); on driving a short distance with them they begin to hang their ears, tumble from side to side and at last fall down in cramp convulsions, after which they can not be got to move from the spot; in a couple of minutes the dog may recover, but when it runs again the whole body quivers and the dog has no power to drag; at the same time, especially when the weather is warm, the animal has diarrhea, its feces are "squirted out" as greenish water; sometimes the animal dies of the sickness. At places where shark food is plentiful, however, the dogs accustom themselves to eating a large amount of it without being sick; but if they are driven in the warm sunshine they may be very bad from it. From dried shark flesh the dogs never become "shark-intoxicated," yet they can also become sick from it, as dried shark meat tends to swell out in the stomachs of the dogs; the Greenlanders therefore advise to give the dogs only small rations of dried shark meat and first to cut the meat into long and narrow strips, so that the dogs do not gulp down the whole at once, but can regularly work through it with the teeth.

To explain these phenomena it may be said that the fresh shark flesh contains a compound that acts like alcohol; when the flesh is boiled, the poisonous stuff is removed and the dogs can then eat more of it without suffering than when the meat is fresh. The poisonous substance is probably present everywhere in the body of the shark, also in the cartilage. Rink was of the opinion that the danger of the shark's flesh was due to its containing a large amount of saline fluids, which were totally swallowed down when the flesh was eaten in the frozen condition. To clear up the matter I consulted the veterinary surgeon S. Hjortlund, who lived for a couple of years in North Greenland and there made investigations on the infectious sickness of the dogs; he has kindly sent me the following information.

"These cases of poisoning, which in Greenland always occur after eating fresh, raw meat of the Greenland shark (*Sominosus microcephalus*), both in men and dogs, is without doubt due to a specific poison (a toxin) which occurs in its body. Nothing indicates the correctness of Rink's view, that the poisonous nature of fresh shark meat was due to the large quantity of saline fluids it contained, whilst many things speak against this view.

"Meanwhile, however, the question has not yet been scientifically investigated and all we know about it is exclusively based on empirical observations.

"The clinical symptoms, of which—as mentioned above—tiredness, dullness, uncertain gait, sensory disturbances and a profuse diarrhea are the most in evidence, depend in virulence on the quantity of meat taken, but in dogs can also be intensified in mild weather and with bodily exertion. In men, where the poison causes a similar complex of symptoms, the sense disturbances both objectively and subjectively give the same impression as acute alcohol poisoning. The symptoms of poisoning may last a shorter or longer time, from a couple of hours to a couple of days. They may be very weak, almost unnoticeable, when the animal has only taken a small quantity; on the other hand dogs have several times been known to die under violent symptoms, almost apoplectic in character, a short time after they had eaten large quantities of shark meat.

"Of importance in judging of the nature of the poisonous stuff or stuffs is the fact that the animals can gradually be accustomed to taking larger and larger quantities of it. Obviously antitoxins can be produced in the body of the dog, which counteract the activity of the poison; in other words, the animal can to a certain degree become immune, and this gradually occurs spontaneously at places where the dogs have constantly the opportunity of eating fresh shark meat.

"The poison, however, is soluble in water and can thus be extracted from the meat by thorough washing. How far, on the other hand, it is destroyed by heating to temperatures below 100° is more doubtful. In any case the transformation here must proceed slowly; for according to all reports the meat must be cooked in two to three different waters before one can be certain that it

[2] "The Selachians of Greenland" ("Saertryk af Mindeskrift for Jepetus Steenstrup") pp. 12–14, 1914.

is not poisonous. It is most reasonable to assume that it is resistant to such a temperature.

"The usual method in practise of preparing the shark flesh so that it may gradually lose its poisonous qualities is to cut the meat into thin strips which are hung up to dry in the sun and air; it thus loses its large quantity of water, and gradually its poisonous qualities disappear, so that it becomes a rather good food for the dogs, though it must still be used with caution and preferably mixed with a little blubber.

"Regarding the seat of the poison in the body of the shark we have the most divergent opinions; some assume that it is only in the musculature, others that it is exclusively present in the cartilage and others again that it is chiefly found in the peritoneal and spinal fluids, as it has been found that these fluids produce a severe pain when received in the eye. A proper judgment on these matters, however, will only be obtained by means of a special investigation of the poison, and such at the same time would elucidate its chemical composition, its physiological properties and various biological reactions."

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SPECIAL ARTICLES

THE CROWN-GALL OF ALFALFA

DURING the past two years the writer has been engaged in studies upon the life-history of the organism described by Magnus[1] in 1902 under the name of *Urophlyctis alfalfæ*. It seems best to publish a brief statement of the results so far obtained, pending further studies.

1. The "resting spores" when placed in water cultures develop into sporangia.

2. Within these sporangia are formed motile spores of two sizes; usually one large spore and many small ones are formed in the same sporangium.

3. One or several small spores may become attached to one large one. Only one remains permanently attached. It has not been determined whether or not this attachment is in the nature of a sexual fusion. If so, the large spores and small spores are obviously capable of functioning as sexually differentiated gametes.

4. The motion of the large spore continues after the attachment of the small spore.

5. The small spores, the large spores and the united spores (zygotes?) become amœboid after a period of motility.

6. In the amœboid state, singly or in groups, these bodies may be observed to move on the surface of the host.

7. In infected soil young alfalfa seedlings develop galls in which plasmodia are found.

8. In older galls similar plasmodia are present which ramify through the tissues of the gall. Previous to spore formation the parasite becomes massed in cavities formed by the destruction of the host tissue.

9. The resting spores are formed in these cavities, apparently by division of the parasite into many cells.

10. The content, cytoplasm and nuclei, of the resting spores in the dormant condition, corresponds to that of the plasmodium in the stage immediately preceding spore formation.

The presence of a plasmodium as the vegetative stage of the parasite and the entire absence of a mycelium at any stage suggest that possibly the organism should be removed from the genus *Urophlyctis*.

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[1] Magnus, P., "Ueber in knolligen Wurzelauswuchsen der Luzerne lebende Urophlyctis," *Ber. der Deut. Bot. Gesell.*, 20, 291–96, 1902. One plate.

A PRELIMINARY NOTE ON THE FOOD HABITS AND DISTRIBUTION OF THE TEXAS HORNED LIZARDS

RANDOM examinations of stomach contents, made by various workers during the past forty years, have indicated that *Phrynosoma cornutum*, the Texas horned lizard, is of great economic importance. To determine its status as a valuable animal, an examination of four hundred and eighty-five stomachs has been made. As only a small per cent. of the animals found in the field were captured and killed, several facts—besides the principal one—concerning this animal have been disclosed.

The Texas horned lizard, unlike the other species of the genus, is distinctly not a desert form. Its area of distribution is quite extensive, going northward into Kansas, southward